



Orthopaedics

FUNCTIONAL AND RADIOLOGICAL OUTCOME OF PATIENTS AFTER HIGH FIBULAR OSTEOTOMY IN OSTEOARTHRITIS OF KNEE AMONG RURAL POPULATION: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT **Background:** Medial compartment osteoarthritis (OA) of the knee with varus deformity is conventionally managed by high tibial osteotomy or unicompartmental/total knee replacement, both of which are technically demanding and carry a longer recovery period. Proximal fibular osteotomy (PFO) with lateral cortical drilling has been proposed as a simpler, minimally invasive alternative aimed at off-loading the medial compartment. This study evaluated the functional and radiological outcome of PFO in a rural Indian population with medial compartment knee OA. **Methods:** This prospective observational study was conducted in the Department of Orthopaedics, P.E.S. Institute of Medical Sciences and Research, Kuppam, between April 2024 and September 2025, on 32 knees (31 patients) with Kellgren-Lawrence grade I–III medial compartment OA, aged 40–65 years. Patients underwent PFO with lateral tibial cortical drilling and were followed up at 1, 3 and 6 months. Outcomes assessed included the Visual Analogue Scale (VAS), modified Oxford Knee Score (OKS), range of motion (ROM), tibiofemoral varus angulation and medial joint space (MJS) on weight-bearing radiographs. **Results:** The mean age was 57 years (59.4% male). Mean VAS improved marginally from 5.93 preoperatively to 5.21 at 6 months. Mean MJS changed from 2.73 mm to 2.43 mm, and mean varus angulation increased from 8.62° to 10.18° at 6 months, indicating no consistent radiological improvement. Radiological improvement was demonstrable in only 25% of knees, while 15.6% showed worsening. Mean ROM declined from 101° to 92°. Complications were minimal (one transient common peroneal neuropraxia, one superficial wound infection), both managed conservatively. **Conclusion:** PFO with lateral cortical drilling is a technically simple, low-morbidity procedure, but in this cohort it produced inconsistent functional benefit without a reproducible radiological improvement in medial joint space or limb alignment at 6 months. Longer-term, larger studies with modified technique are warranted before the procedure can be recommended as a reliable alternative to established osteotomy or arthroplasty options.

KEYWORDS : Proximal Fibular Osteotomy; Knee Osteoarthritis; Medial Compartment; Varus Deformity; Functional Outcome; Rural Population.

INTRODUCTION

Osteoarthritis (OA) of the knee is a progressive joint disorder in which the articular cartilage gradually wears down, producing pain, stiffness, deformity and a reduced arc of movement. The condition is more frequent in men before the age of 45 and in women thereafter, and its occurrence is linked to a sedentary routine, excess body weight, advancing age and occupations involving repetitive joint loading^{1,2}.

Non-operative management of knee OA includes analgesics, physiotherapy, intra-articular viscosupplementation and corticosteroid or platelet-rich plasma injections. Total knee replacement remains the standard for elderly patients with tricompartmental disease, while in younger patients with isolated medial compartment OA and varus deformity, high tibial osteotomy (HTO) or unicompartmental knee replacement are the established surgical options. Both carry their own complication profiles and require a longer recovery with restricted weight-bearing³.

Proximal fibular osteotomy (PFO) with lateral cortical drilling has been described as a technically simpler, minimally invasive alternative for medial compartment knee OA. The biomechanical rationale is that the medial tibial plateau is supported by a single cortex over predominantly cancellous bone, whereas the lateral plateau is buttressed by three cortices — one from the tibia and two from the fibular strut — rendering it comparatively rigid. With age-related bone loss, this asymmetry is hypothesised to produce gradual lateral over-support and progressive varus collapse of the medial compartment^{4,5}. Resection of a short fibular segment, 7–8 cm below the fibular head, is intended to relieve this lateral over-support, redistribute load away from the overloaded medial compartment, and shift the mechanical axis towards neutral⁶.

Although biomechanically appealing and reported as safe in several recent series, the published literature on PFO for medial compartment knee OA remains comparatively limited, particularly from rural Indian settings where access to costlier reconstructive surgery is constrained^{7,8}. This study was undertaken to evaluate the functional

and radiological outcome of PFO with lateral cortical drilling in a rural population attending a tertiary care teaching hospital.

AIMS AND OBJECTIVES

To evaluate the functional and radiological outcome of high (proximal) fibular osteotomy in patients with medial compartment osteoarthritis of the knee in a rural population.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Orthopaedics, P.E.S. Institute of Medical Sciences and Research (PESIMSR), Kuppam, between April 2024 and September 2025, after approval from the Institutional Human Ethics Committee (Approval No. PESIMSR/IHEC/C-101/2024, dated 16/03/2024). Written informed consent was obtained from all participants.

Thirty-one patients (32 knees) aged 40–65 years with medial compartment knee OA, Kellgren-Lawrence (KL) grade I, II or III, attending the outpatient department were enrolled. Patients with valgus knee deformity, ligamentous instability, or inflammatory arthritis were excluded.

Evaluation

All patients underwent detailed history-taking, clinical examination, standard weight-bearing antero-posterior and lateral radiographs of the knee, and routine pre-anaesthetic work-up. Pain was assessed using the Visual Analogue Scale (VAS, 0–10), and function using the modified Oxford Knee Score (OKS), recorded preoperatively and at 0, 1, 3 and 6 months postoperatively. Whole-limb weight-bearing radiographs were used to determine the hip-knee-ankle (tibiofemoral/varus) angle and the medial-to-lateral joint space ratio, with the medial joint space (MJS) measured as the perpendicular distance between the lowest point of the medial femoral condyle and the medial tibial plateau.

Surgical Technique

With the patient supine and the knee flexed to 45°, the osteotomy level

was marked 7–8 cm distal to the fibular head. Through a 6–7 cm lateral incision, the soleus and peroneus muscles were retracted and the fibular shaft exposed subperiosteally. A 20 mm segment of fibular shaft was excised using drill-hole marking followed by an oscillating saw, with care taken to protect the common peroneal nerve. Lateral tibial cortical drilling was performed as an adjunctive step. The wound was closed in layers with a compressive dressing.

Patients were mobilised with ankle pump and quadriceps strengthening exercises in the early postoperative period and progressed to weight-bearing as tolerated. Follow-up assessments (VAS, OKS, ROM, varus angle, MJS) were performed at 1, 3 and 6 months. Statistical analysis was performed with the assistance of the Department of Community Medicine; a p-value <0.05 was considered statistically significant.

RESULTS

Of 32 operated knees, 28 (in 27 patients) completed follow-up to 6 months; two patients were lost to follow-up after the first month, one did not return after surgery, and one died after the third-month visit of unrelated medical causes. The mean age was 57 years (range 40–71 years), with 19 males (59.4%) and 13 females (40.6%); mean BMI was 28.9 kg/m². The majority of knees (75%) were KL grade II, 18.75% grade I and 6.25% grade III; none were grade IV.

Table 1. Comparison of functional and radiological parameters, preoperative versus 6-month follow-up.

Parameter	Preoperative	6 months	p-value
VAS score (mean)	5.93	5.21	<0.001*
Modified OKS (mean, category trend)	Higher (worse function)	Improved trend, partial	<0.001*
Medial joint space (mm)	2.73	2.43	0.005*
Varus angulation (degrees)	8.62	10.18	0.005*
Range of motion (degrees)	101	92	—

Radiological improvement (increase in MJS) was demonstrable in only 8 of 32 knees (25%), while 5 knees (15.6%) showed radiological worsening and the remaining 59.4% showed no demonstrable change. The maximum medial joint space gain recorded at any point was 0.3 mm. Among knees with radiological improvement, 4 (12.5%) also had a satisfactory functional outcome, while 1 (3.1%) improved functionally without radiological correlate. Three knees (9.4%) showed both functional and radiological worsening. Mean varus angulation, contrary to the intended mechanism, increased from 8.62° to 10.18° over the follow-up period, and mean ROM decreased from 101° to 92° at 6 months.

Table 2. Complications encountered (N = 32).

Complication	Frequency (n)	Percentage (%)
No complication	30	93.75
Common peroneal neuropaxia (transient)	1	3.125
Superficial wound infection	1	3.125
Vascular injury / joint infection	0	0

No major complications such as vascular injury, deep infection or non-union occurred. The single case of common peroneal neuropaxia recovered fully by the first-month follow-up, and the superficial wound infection resolved with antibiotic therapy.

DISCUSSION

The rationale underlying PFO is that resection of the lateral fibular strut reduces an ostensibly non-essential lateral buttress, permitting gradual settlement of the proximal tibia into a more neutral or valgus alignment and thereby off-loading the medial compartment^{4,6}. While biomechanically appealing, this study did not demonstrate consistent, reproducible pain relief or radiological correction, in contrast to some of the rapid and dramatic improvements reported with other surgical options such as HTO and arthroscopic procedures for early OA.

Zhang et al.⁵ reported mechanical axis improvement correlating with pain relief after PFO; in the present series, only a minority of knees showed measurable axis or joint-space improvement, and mean varus angulation in fact worsened over follow-up. Because natural

settlement of the tibial plateau is a gradual process, it may not be realistic to expect prompt radiological re-alignment from fibular osteotomy alone within a 6-month window; this may explain why the lateral cortical drilling was added as an adjunctive measure in our protocol, though even this combination did not yield consistent results. By contrast, Wang et al.⁹ reported that PFO relieved pain and improved joint function together with the medial joint space in their series, and Kumar et al.¹⁰ observed a progressive fall in VAS pain scores with improving knee society scores over one year of follow-up. The more consistent benefit described in these reports, compared with the present series, may reflect differences in follow-up duration, patient selection, or technical variation between centres.

Existing comparative literature suggests that several procedures — osteotomy, unicondylar replacement, total knee arthroplasty and arthroscopic debridement — can each improve functional scores in medial compartment OA, with osteotomy and partial knee replacement offering benefit in the short term and total knee arthroplasty providing more durable results over the long term¹¹. HTO and unicompartmental arthroplasty remain technically demanding procedures with definable complications — correction error, altered posterior tibial slope, and lateral hinge fracture (as reported by Lee et al., cited in³) — whereas the principal technical hazard of PFO is traction injury to the common peroneal nerve, as observed in one patient in this series who recovered fully.

The relative paucity of literature specific to PFO in medial compartment knee OA³ limits direct comparison. Our findings — modest VAS improvement without consistent radiological correlate, and an actual increase in mean varus angulation and reduction in ROM at 6 months — raise the possibility that an alternative, as yet undefined mechanism (rather than measurable lower-limb realignment) may underlie the symptomatic improvement reported by some patients, since the procedure does not directly alter joint morphology or elevate the medial plateau.

Limitations of this study include the relatively small sample size, loss to follow-up in four knees, and a follow-up duration restricted to 6 months, which may be insufficient to capture the gradual settlement process proposed in the underlying biomechanical hypothesis. Larger studies with longer follow-up and possible technical modifications are required before PFO can be recommended as a reliable, reproducible alternative to HTO or arthroplasty in this patient population.

CONCLUSION

Proximal fibular osteotomy with lateral cortical drilling is a simple, low-morbidity day-care-type procedure that may be considered in resource-limited, rural settings where major reconstructive surgery is less accessible. However, in this prospective series, the procedure produced inconsistent functional benefit and did not reliably improve medial joint space or correct varus alignment at 6 months. The technique warrants further evaluation in larger cohorts with longer-term follow-up and possible technical refinement before being recommended as a dependable surgical option for medial compartment knee osteoarthritis.

ETHICAL APPROVAL

Institutional Human Ethics Committee, PESIMSR, Kuppam (Approval No. PESIMSR/IHEC/C-101/2024, dated 16/03/2024).

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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